REMARKS

Claims 1-20 are all the claims pending in the application. By this Amendment, Applicants amend **claims 1 and 12** for clarity and add **new claims 19 and 20**. No new subject matter has been entered.

Applicants respectfully submit that claims are patentable over the cited prior art, even without the amendments. The Examiner is respectfully requested withdraw rejection of the claims or offer a substantive rebuttal of each point of the argument presented below.

I. Rejection of claims 1-18

Claims 1-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori (JP Patent Document No. 2001/105106) in view of Muench (U.S. Patent No. 4,977,950).

Claim 1 recites among other elements: "each of said protrusion portions or the concave portions has a size satisfying expressions:

$H \geq 2mm$

$L > 2 X H$

in which H is a maximum height of the protrusion portion or a maximum depth of the concave portion, and L is a maximum length of a base portion of the protrusion portion or the concave portion, to prevent a flow of the molten steel from stagnating in the molten steel flow hole portion."

Mori describes an immersion nozzle having an inner hole surface in a rugged shape. A depth from a top of the projection to a bottom of the recession is 0.5-5mm. The distance between center points of the neighboring projections or recessions is 1-20mm. (Abstract, Fig. 2).

The Examiner concedes that Mori does not teach discontinuous protrusions in directions parallel and perpendicular to a molten steel flowing direction. (*See* Office Action, page 3, lines 3-5). Applicants agree with the Examiner.

As seen in Fig. 2, Mori's wave-like inner hole surface does not include discontinuous protrusion portions or concave portions. Nor does it include independent members.

To the contrary, claim 1 calls for "independent members … discontinuous in both directions parallel and perpendicular to a molten steel flowing direction."

But, the Examiner asserts that Muench teaches protrusions discontinuous in both directions and that it would have been obvious to have shaped and arranged protrusions of Mori as taught by Muench. (*See* Office Action, page 3, lines 5-14).

Muench describes a rotating ejection nozzle with internal serrations. (Col. 4, lines 47-54, Fig. 3).

As best understood, the Examiner proposes modifying the wave-like surface of the inner hole of Mori with the Muench's serrations. However, such modification will render Mori unsatisfactory for its intended purpose. Additionally, the Examiner's statement that Muench inhibits stagnation is hereby traversed as being inaccurate. (*See* Office Action, page 3, lines 13-14). This conclusion is not supported by any experimental data in Muench's disclosure or any other objective scientific evidence and, as such, is invalid.

The gist of Mori's invention is the immersion nozzle for continuous casting which prevents sticking of alumina in the inner hole. (Abstract). If the surface of the inner hole of Mori is modified with the serrations of Muench, as proposed by the Examiner, the alumina will be sticking around the serrations of the inner hole. Accordingly, Mori will become unsatisfactory for its intended purpose. A proposed combination of Mori and Muench will fail to inhibit the deposition of alumina in the inner hole of the immersion nozzle.

Additionally, Muench is directed to the rotating ejection nozzle which operates by spreading a flow of molten metal from the end of the nozzle. (Fig. 3). Accordingly, Muench is not in the field of the immersion nozzles and, additionally, is not reasonably pertinent to the problem of preventing the deposition of the alumina in the inner hole - the problem with which the inventor was concerned.

The immersion nozzle is the nozzle which casts by immersing in a molten metal tank, as described, for example, in the specification on page 30, line 3 to page 31, line 15. The device (nozzle) of the present invention is not of the spray type like that of Muench, but is an immersion nozzle having its lower end portion (at least along a length of 10 mm) immersed in a molten metal.

Other distinguishing features of the immersion nozzles are:

-The immersion nozzle is not used in a closed space as the device of Muench is, but its portion not immersed in the molten metal is exposed to the open air (and is visible). In addition, the immersion nozzle has a surface coated with a vitreous antioxidant for preventing the oxidation of graphite and sometimes covered with a ceramic paper or blanket for the thermal insulation of the immersion nozzle.

-The immersion nozzle can be used in the open air without causing the oxidation of the molten metal, since its lower end portion is immersed in the molten metal.

-Whenever the immersion nozzle is used for casting steel, a mold flux is applied to the surface of the molten steel in a mold.

-Whenever the immersion nozzle is used for casting steel, a mold, such as a billet, bloom, slab or beam blank, is used. The mold is substantially vertical so that when water is poured along the inner wall of the mold, the molten steel has its surface cooled and solidified to form a shell.

-When the immersion nozzle is used for casting steel, a slide plate or stopper is almost always used to regulate the flow rate.

-The immersion nozzle is made of a refractory material, namely an oxide such as Al_2O_3, MgO, SiO_2 or ZrO_2, and graphite. Generally, its portion which may contact the mold flux is made of ZrO_2 and carbon, while the rest is made of Al_2O_3 and carbon, or Al_2O_3, SiO_2 and carbon, and an inner tube which may be formed with a thickness of several millimeters can also be made of a graphite-free material, such as Al_2O_3, Al_2O_3 and SiO_2 or Ca0 and ZrO_2.

Accordingly, Applicants respectfully submit that Muench is not analogous art and/or teaches away from the present invention and request the rejection over Muench be withdrawn.

Additionally, Mori teaches the interval or distance between the center points of the protrusions of 1-20mm. Mori does not teach or suggest a relationship between the maximum height of the protrusions and the maximum size of the base portion. To the contrary, claim 1 calls for the maximum length of the base portion of the protrusion or recession to be as twice as the maximum height of the protrusion or recession.

Further, there is no teaching, suggestion, or motivation to combine or modify Muench with Mori. Applicants were first to discover a relationship between the maximum length of the base portion of the independent member and its maximum height.

Moreover, since an exemplary embodiment provides improved performance of the immersion nozzle, as discovered by Applicants, the exemplary embodiment cannot be obvious. As described and documented in the specification of the present application, it took a great deal of experimentation and trying to discover the appropriate dimensions of the independent members and relationships between the maximum length of the base portion of the independent members and their maximum heights. The same is true for the various shapes of the independent members and their positioning in the inner hole.

Accordingly, Applicants respectfully submit that neither Muench, nor Mori, taken singularly or in combination, teaches or suggests at least "independent members ... discontinuous in both directions parallel and perpendicular to a molten steel flowing direction ..., ... each of said protrusion portions or the concave portions has a size satisfying expressions:

$H \geq 2mm$

$L > 2 \times H$

in which H is a maximum height of the protrusion portion or a maximum depth of the concave portion, and L is a maximum length of a base portion of the protrusion portion or the concave portion, to prevent a flow of the molten steel from stagnating in the molten steel flow hole portion, ...wherein the casting nozzle is an immersion nozzle."

Also, it would not have been obvious for one skilled in the art to combine or modify Mori with Muench.

Therefore, **claim 1 and dependent claims 2-18** are patentable over Mori and Muench.

Additionally, **claim 2** recites "an expression: $L \leq \pi D/3$ in which L is the maximum length of a base portion of the protrusion portion or the concave portion, and D is an inner diameter of the nozzle before the protrusion portions or concave portions are disposed."

Neither Muench, nor Mori, taken singularly or in combination, teaches or suggests a relationship between the maximum length of the independent member base portion and the inner diameter of the nozzle, prior to disposing the protrusion portions or concave portions.

The Examiner states that it would have been obvious to "proclaim $L \leq \pi D/3$ since our reviewing courts have held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed

relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device." *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984). (*See* Office Action, page 3, #4).

Contrary to the above statement, the device of claim 2 performs differently from a proposed combination of Mori and Muench, in actually preventing the generation of the stagnation area in the inner hole. However, a proposed combination of Mori and Muench will exhibit depositions of alumina around the serrations.

Further, as discussed in MPEP § 2144, if the facts in a prior legal decision are sufficiently similar to those in an application under examination, the Examiner may use the rationale used by the court. However, if the applicant has demonstrated the criticality of a specific limitation, it would not be appropriate to rely solely on the rationale used by the court to support an obviousness rejection. MPEP § 2144.

Applicants of the present application demonstrated by multiple examples discussed in the specification how the dimensions of the protrusions/concaves affect depositions of material in the inner hole. The Examiner improperly relies solely on the decision and facts of *Gardner* to establish obviousness.

Accordingly, Applicants respectfully submit the Examiner did not establish *a prima facie* obviousness. Additionally, it is not obvious to "proclaim" the specific recited dimensions, as the Examiner contends, at least for the reasons discussed above.

Accordingly, **claim 2** is patentable over Mori and Muench.

Claim 7 recites: "a distance between the base portions of said protrusion portions in the direction parallel to the molten steel flowing direction is selected to be equal to or greater than 20 mm to prevent generation of a stagnation portion on an area of the inner hole portion disposed under the protrusion portion."

As discussed above, a proposed combination of Mori and Muench will result in generation of the stagnation area in the inner hole, around the serrations. Further, the Examiner does not appear to address the aspect of selecting the distance between the base portions "to prevent generation of a stagnation portion on an area of the inner hole portion disposed under the protrusion portion."

Accordingly, **claim 7** is patentable over Mori and Muench.

Claim 10 recites: "an angle between a nozzle inner pipe and a lower end portion of each of said protrusion portions ... is selected to be equal to or less than 60° to prevent generation of a stagnation portion on an area of the inner hole portion disposed under the protrusion portion."

The Examiner asserts that the protrusions of Muench appear to be at about 60 degree angle. (*See* Office Action, page 4, #5). To the contrary, from Fig. 3 of Muench, the serrations appear to be at about 90 degrees. Further, Muench's disclosure does not provide any specifics regarding the position of the serrations.

The Examiner further states that discovering a result effective variable only involves routine skill in the art. However, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. MPEP § 2144.05. The Examiner did not demonstrate that an angle between a nozzle inner pipe and a lower end portion of each protrusion portion selected to be equal to or less than 60° has been recognized a result effective variable in the prior art to prevent generation of a stagnation portion on an area of the inner hole portion disposed under the protrusion portion.

Accordingly, the rejection is improper and **claim 10** is patentable.

Claim 15 recites: "the independent members include at least one of elliptical, spherical, semi-spherical, and approximate polygonal pyramid independent members."

The Examiner appears to assert the protrusion portions of Mori to allegedly teach the spherical protrusion portions. (*See* Office Action, page 3, line 1).

As discussed above, Mori does not teach or suggest the independent members. Further, Mori only describes that the surface is rugged. Mori does not discuss the particulars of the shapes embodied on the surface of the inner hole.

Accordingly, Applicants respectfully submit that Mori does not teach or suggest the spherical independent members.

Further, the Examiner asserts the serrations of Muench to allegedly teach approximate polygonal pyramid independent members. (*See* Office Action, page 3, lines 8-9). However, the serrations of Muench, shown in Fig. 3, do not have a shape of an approximate polygonal pyramid. Nor does Muench's disclosure provide any specifics regarding the shape of the serrations.

Accordingly, Applicants respectfully submit that neither Mori, nor Muench, taken singularly or in combination, teaches or suggests at least "the independent members include at least one of elliptical, spherical, semi-spherical, and approximate polygonal pyramid independent members." Therefore, **claim 15** is patentable over Mori and Muench.

Claim 16 recites aspects similar to those recited in claim 15 and, therefore, is patentable over Mori and Muench at least for the reasons similar to those discussed above regarding claim 15.

Claim 17 recites aspects similar to those recited in claims 7, 10, and 15 and, therefore, is patentable over Mori and Muench at least for the reasons similar to those discussed above regarding claims 7, 10, and 15.

Claim 18 recites aspects similar to those recited in claim 7 and, therefore, is patentable over Mori and Muench at least for the reasons similar to those discussed above regarding claim 7.

II. New Claims

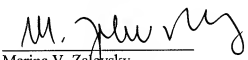
In order to provide more varied protection, Applicants add new **claims 19 and 20**, which are patentable at least by virtue of their dependencies and for additional features set forth therein.

CONCLUSION

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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